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Monthly Performance Report

PAGE JACKSON SCHOOL

MAY 1979

FEB 14 1980

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT
PAGE JACKSON SCHOOL
MAY 1979

I. SYSTEM DESCRIPTION

Page Jackson School is an elementary school located in Charles Town, West Virginia. The solar energy system is designed to provide approximately 85 percent of the space heating and 50 percent of the space cooling energy requirements of the school. It has an array of flat-plate collectors with a gross area of 11,000 square feet that faces south at an angle of 45 degrees from the horizontal. Water is used as the medium for delivering solar energy from the collector array to storage. The solar heated water is stored in two interconnected 10,000-gallon storage tanks and is used for space heating and cooling. When the solar energy is insufficient to meet the heating demands, an oil-fired boiler is used to provide auxiliary hot water for heating. In the space cooling mode, the hot water from storage is supplied to an absorption chiller to generate chilled water. A conventional centrifugal chiller is used as backup whenever solar energy is insufficient to meet the space cooling demand.

The system, shown schematically in Figure 1, has three modes of solar operation.

Mode 1 - Collector-to-Storage: The collector subsystem operates independently of the other subsystems. It is active whenever the solar collector temperature is higher than the temperature in storage (hot water thermal storage). When the hot water thermal storage temperature is equal to, or greater than the collector temperature, solar pump P7 is shut down (pump P8 is a backup pump). An emergency mode of operation to prevent overheating of the collectors is manually activated to allow water to continuously circulate through the collectors.

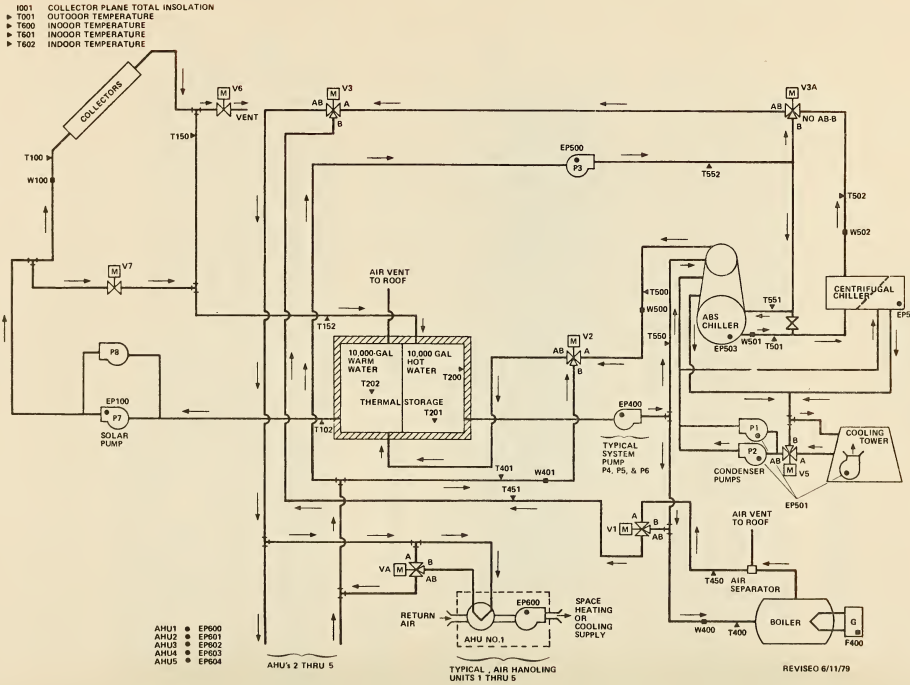

Figure 1. PAGE JACKSON SCHOOL SOLAR ENERGY SYSTEM SCHEMATIC

Mode 2 - Space Heating: This mode is entered when the manual SUMMER-WINTER-AUTOMATIC switch is set to AUTOMATIC and the outside ambient temperature is below 60°F, or when the switch is set to WINTER. Whenever the temperature of the air returning from the air-handling units is below 68°F and the hot water storage temperature is less than 123°F, auxiliary heating is put into the ready condition. The burner for the boiler maintains a boiler water temperature of 160°F. When the hot water drops below 113°F, the boiler is activated, when the storage temperature rises above 113°F, or the return air temperature rises above 68°F, auxiliary heating is shut off.

Mode 3 - Space Cooling: This mode is entered when the manual SUMMER-WINTER-AUTOMATIC switch is set to AUTOMATIC and the outside ambient temperature is above 68°F, or when the switch is set to SUMMER. There are two modes of space cooling; one utilizes the absorption chiller, the other the backup centrifugal chiller. When the hot water thermal storage temperature rises above 180°F, system pumps P4, P5, and P6 are activated to generate flow through the absorption chiller. As the inlet water temperature to the chiller rises above 180°F, the chilled water temperature out of the absorption chiller will become colder. As the temperature from hot water thermal storage drops below 180°F, the reverse will occur. When the hot water thermal storage temperature drops below 171°F, system pumps will stop, and the absorption chiller will no longer be used for space cooling. If there is a demand for space cooling and the storage temperature is below 171°F, the backup centrifugal chiller is used to satisfy the demand.

II. PERFORMANCE EVALUATION

The system performance evaluations discussed in this section are based primarily on the analysis of the data presented in the attached computer-generated monthly report. This attached report consists of daily site thermal and energy values for each subsystem, plus environmental data. The performance factors discussed in this report are based upon the definitions contained in NBSIR 76-1137, Thermal Data Requirements and Performance Evaluation Procedures for the National Solar Heating and Cooling Demonstration Program.

A. Introduction

The solar energy system at Page Jackson School operated continuously during May, and satisfied 49 percent of the total space heating and cooling energy requirements. The space cooling load of 43.83 million Btu was the largest experienced to date and was 30 percent supported by the solar energy system. All of the 16.04 million Btu space heating load was supported by the solar energy system.

B. Weather

May is entering into the cooling season in the Page Jackson School area, with a long-term average outside ambient temperature of 64°F. The actual outside ambient temperature averaged 63°F during May. The measured insolation in the plane of the collector array averaged 1,541 Btu/ft^2-day, which is above the expected long-term average of 1,417 Btu/ft^2-day derived from measurements taken at the Washington, D. C. Airport.

C. System Thermal Performance

Collector - Of the 525.40 million Btu of solar energy incident on the collector array during May, 409.28 million Btu were incident on the array when there was flow through the collector array. The system collected 83.21 million Btu, or 16 percent of the total insolation incident on the collector array. The operation of solar pumps P7 and P8 required 2.22 million Btu of electrical energy.

Storage - Measurements indicated that 84.17 million Btu of energy was delivered to storage. There was no auxiliary energy input to the storage tanks this month, since the boiler is not used to support the space cooling load. The result is that a slight energy imbalance exists (0.96 million Btu) between the amount of thermal energy collected, and the amount delivered to storage, due to separate instrumentation for each measurement. This discrepancy, over the course of a month, is small enough to have little effect on the results.

The large amount of insolation during May combined with relatively small loads resulted in very high storage tank temperatures. The average temperature for the month was 183°F with eight days averaging 200°F or above. This has produced relatively large thermal losses from the storage tanks this month, 33.04 million Btu.

Space Heating Load - The space heating load experienced in May was 16.04 million Btu. This is very small compared to all previous months. The demand occurred primarily early in the month and was 100 percent supported by the solar system.

Space Cooling Load - A space cooling load of 43.83 million Btu was experienced during May. A total of 31.22 million Btu of solar energy was supplied to the absorption chiller, allowing it to support 30 percent of the space cooling load with solar energy. The remainder of the space cooling load was supported by the electric centrifugal chiller in the conventional (non-solar) system.

D. Observations

Total demands on the solar energy system at Page Jackson School were significantly smaller than any experienced at the site since monthly reporting started in October 1978. This is primarily due to mild temperatures during the entire month. The amount of solar energy incident and, therefore, collected during May was larger than during any past month except March. This resulted in the solar energy system supporting a relatively large portion of the loads, in spite of the poor collector performance that has been experienced at the school.

Since the space heating load was completely supported by the solar energy system, and the auxiliary space cooling system uses electrical rather than thermal energy input, there was no auxiliary thermal energy used in May. All of the thermal energy entering and leaving the storage tanks was solar energy this month.

Thermal energy losses from the storage tanks were quite large this month because, for most of the month, the tanks remained at extremely high temperatures. Additional insulation could probably reduce this loss, but this situation is unique, and probably will not occur often during the year.

E. Energy Savings

The Page Jackson School solar energy system resulted in a fossil savings of 26.74 million Btu during the month of May. Total system electrical savings was 0.31 million Btu, and converting this to fossil energy yields 1.03 million Btu. Therefore, the net fossil savings was 27.77 million Btu. The fossil energy savings calculations are based on a comparison of the projected energy requirements of a conventional, fossil energy boiler, with an efficinecy of 60 percent, and the energy requirements of the solar energy system.

III. ACTION STATUS

None.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VIRGINIA SOLAR/2036-79/05
REPORT PERIOD: MAY,1979

SITE/SYSTEM DESCRIPTION:
THE PAGE JACKSON SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND COOLING. THE SYSTEM USES WATER AS A COLLECTION AND STORAGE MEDIUM. HOT WATER FROM THE STORAGE TANK IS DIRECTED EITHER TO IN-DUCT HEATING COILS OR TO THE GENERATOR OF AN ABSORPTION AIR CONDITIONER. A FUEL OIL FIRED BOILER PROVIDES AUXILIARY HOT WATER FOR SPACE HEATING. A CENTRIFUGAL CHILLER PROVIDES ADDITIONAL CHILLED WATER FOR SPACE COOLING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	525.399 MILLION BTU
	47764 BTU/SQ.FT.
COLLECTED SOLAR ENERGY	83.210 MILLION BTU
	7564 BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	63 DEGREES F
AVERAGE BUILDING TEMPERATURE	76 DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.09
ECSS OPERATING ENERGY	2.215 MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	25.266 MILLION BTU
TOTAL ENERGY CONSUMED	117.986 MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	N.A.	16.042	43.826	59.868 MILLION BTU
SOLAR FRACTION	N.A.	100	30	49 PERCENT
SOLAR ENERGY USED	N.A.	16.041	31.224	47.467 MILLION BTU
OPERATING ENERGY	N.A.	6.641	16.410	25.266 MILLION BTU
AUX. THERMAL ENERGY	N.A.	0.034	6.343	6.411 MILLION BTU
AUX. ELECTRIC FUEL	N.A.	N.A.	9.062	9.062 MILLION BTU
AUX. FOSSIL FUEL	N.A.	0.057	N.A.	0.057 MILLION BTU
ELECTRICAL SAVINGS	N.A.	-1.882	4.336	0.311 MILLION BTU
FOSSIL SAVINGS	N.A.	26.736	N.A.	26.736 MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.523

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VIRGINIA SCLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	26.062	55	2.569	N	0.122	N	0.099
2	24.824	57	3.490	O	0.117	O	0.141
3	5.819	63	1.484	T	0.011	T	0.255
4	4.380	55	2.121		0.000		0.484
5	26.004	52	2.562	A	0.120	A	0.099
6	23.489	60	2.401	P	0.114	P	0.102
7	24.358	69	0.801	P	0.115	P	0.033
8	23.818	75	0.021	L	0.101	L	0.001
9	23.390	76	1.223	I	0.081	I	0.052
10	20.813	77	4.639	C	0.108	C	0.223
11	23.522	74	4.856	A	0.112	A	0.206
12	12.952	72	1.818	B	0.054	B	0.140
13	4.697	65	0.000	L	0.015	L	0.000
14	13.621	61	0.000	E	0.082	E	0.000
15	19.759	63	2.489		0.096		0.126
16	29.322	60	0.000		0.121		0.000
17	26.181	56	1.848		0.092		0.071
18	16.110	57	1.563		0.052		0.097
19	18.998	63	0.000		0.068		0.000
20	16.127	66	0.000		0.057		0.000
21	4.817	63	2.043		0.000		0.424
22	24.868	66	3.957		0.104		0.159
23	9.037	66	2.519		0.040		0.279
24	16.763	66	1.886		0.076		0.113
25	7.673	57	0.000		0.022		0.000
26	9.482	52	0.000		0.028		0.000
27	13.226	58	0.000		0.061		0.000
28	8.779	56	0.000		0.036		0.000
29	17.882	62	1.636		0.084		0.092
30	20.882	67	0.000		0.118		0.000
31	7.746	66	1.541		0.008		0.199
SUM	525.399	-	47.467	N.A.	2.215	N.A.	-
AVG	16.948	63	1.531	N.A.	0.071	N.A.	0.090
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VIRGINIA SOLAR/2036-79/05
REPORT PERIOD: MAY,1979

SITE/SYSTEM DESCRIPTION:
THE PAGE JACKSON SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND COOLING. THE SYSTEM USES WATER AS A COLLECTION AND STORAGE MEDIUM. HOT WATER FROM THE STORAGE TANK IS DIRECTED EITHER TO IN-DUCT HEATING COILS OR TO THE GENERATOR OF AN ABSORPTION AIR CONDITIONER. A FUEL OIL FIRED BOILER PROVIDES AUXILIARY HOT WATER FOR SPACE HEATING. A CENTRIFUGAL CHILLER PROVIDES ADDITIONAL CHILLED WATER FOR SPACE COOLING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	554.295 GIGA JOULES
	542404 KJ/SQ.M.
COLLECTED SOLAR ENERGY	87.786 GIGA JOULES
	85902 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	17 DEGREES C
AVERAGE BUILDING TEMPERATURE	24 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.09
ECSS OPERATING ENERGY	2.337 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	26.655 GIGA JOULES
TOTAL ENERGY CONSUMED	124.475 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	N.A.	16.924	46.237	63.161 GIGA JOULES
SOLAR FRACTION	N.A.	100	30	49 PERCENT
SOLAR ENERGY USED	N.A.	16.924	32.941	50.078 GIGA JOULES
OPERATING ENERGY	N.A.	7.006	17.313	26.655 GIGA JOULES
AUX. THERMAL ENG	N.A.	0.036	6.692	6.763 GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	N.A.	9.561	9.561 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	0.060	N.A.	0.060 GIGA JOULES
ELECTRICAL SAVINGS	N.A.	-1.986	4.574	0.328 GIGA JOULES
FOSSIL SAVINGS	N.A.	28.206	N.A.	28.206 GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.523

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978. SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PPOGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VISOLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	26.062	24.022	5.938	61	0.228
2	24.824	22.453	5.670	68	0.228
3	5.819	0.948	0.000	67	0.000
4	4.380	0.000	0.000	56	0.000
5	26.004	23.937	6.635	57	0.255
6	23.489	20.787	5.658	71	0.241
7	24.358	21.669	4.883	80	0.200
8	23.818	20.911	3.561	86	0.149
9	23.390	20.363	4.129	*	0.177
10	20.813	17.241	3.645	89	0.175
11	23.522	21.098	5.460	88	0.232
12	12.952	8.118	1.297	78	0.100
13	4.697	1.486	0.025	68	0.005
14	13.621	10.842	1.427	*	0.105
15	19.759	16.238	3.631	77	0.184
16	29.322	27.591	5.563	*	0.190
17	26.181	22.428	4.217	65	0.161
18	16.110	10.631	1.707	67	0.106
19	18.998	15.168	2.054	70	0.108
20	16.127	11.991	1.111	72	0.069
21	4.817	0.000	0.000	65	0.000
22	24.868	21.032	5.141	73	0.207
23	9.037	5.222	0.731	70	0.081
24	16.763	12.966	2.662	70	0.159
25	7.673	2.134	0.000	59	0.000
26	9.482	3.675	0.463	55	0.049
27	13.226	9.959	1.127	66	0.085
28	8.779	3.911	0.412	62	0.047
29	17.882	13.153	3.043	72	0.170
30	20.882	18.323	3.020	79	0.145
31	7.746	0.983	0.000	72	0.000
SUM	525.399	409.279	83.210	-	-
AVG	16.948	13.203	2.684	70	0.158
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VISOLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	6.010	2.569	2.236	163	0.800
2	5.824	3.490	1.141	171	0.795
3	0.001	1.484	-2.722	168	1241.641
4	0.000	2.121	-3.256	151	1.000
5	6.741	2.562	3.295	150	0.869
6	5.722	2.401	2.341	165	0.829
7	4.996	0.801	3.413	185	0.844
8	3.622	0.021	1.817	205	0.507
9	3.957	1.223	-1.049	209	0.044
10	3.650	4.639	-2.201	194	0.668
11	5.545	4.856	-0.154	187	0.848
12	1.296	1.818	-1.315	181	0.388
13	0.020	0.000	-0.675	177	-33.723
14	1.441	0.000	0.930	178	0.645
15	3.715	2.489	0.549	184	0.818
16	5.639	0.000	4.476	201	0.794
17	4.136	1.848	0.031	209	0.454
18	1.729	1.563	-0.658	207	0.523
19	2.084	0.000	0.758	207	0.364
20	1.129	0.000	-0.008	209	-0.007
21	0.000	2.043	-2.818	200	1.000
22	5.140	3.957	0.185	192	0.806
23	0.760	2.519	-2.893	180	-0.492
24	2.662	1.886	0.054	175	0.729
25	0.000	0.000	-1.042	171	1.000
26	0.485	0.000	-0.171	167	-0.353
27	1.134	0.000	0.405	167	0.357
28	0.440	0.000	-0.132	168	-0.300
29	3.162	1.636	1.018	171	0.839
30	3.129	0.000	2.638	183	0.843
31	0.000	1.541	-2.537	184	1.000
SUM	84.168	47.467	3.658	-	-
AVG	2.715	1.531	0.118	183	0.607
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VIRGINIA SOLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
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31												
SUM	N.A.	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-	-	N.A.
AVG	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VI SOLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	2.569	100	2.569	1.134	0.000	N	0.000	-0.306	4.282	76	55
2	3.490	100	3.490	1.448	0.000	O	0.000	-0.306	5.816	77	57
3	1.484	100	1.484	0.747	0.001	T	0.002	-0.219	2.473	78	63
4	2.121	100	2.121	1.470	0.000		0.000	-0.307	3.535	77	55
5	2.562	100	2.562	0.697	0.000	A	0.000	-0.307	4.271	74	52
6	2.401	100	2.401	0.694	0.000	P	0.000	-0.307	4.002	76	60
7	0.801	100	0.801	0.297	0.000	P	0.000	-0.115	1.335	78	69
8	0.000	0	0.000	0.000	0.000	L	0.000	0.000	0.000	78	75
9	0.000	0	0.000	0.000	0.000	I	0.000	0.000	0.000	77	76
10	0.000	0	0.000	0.000	0.000	C	0.000	0.000	0.000	78	77
11	0.000	0	0.000	0.000	0.000	A	0.000	0.000	0.000	78	74
12	0.000	0	0.000	0.000	0.000	B	0.000	0.000	0.000	75	72
13	0.000	0	0.000	0.000	0.000	L	0.000	0.000	0.000	78	65
14	0.000	0	0.000	0.000	0.000	E	0.000	0.000	0.000	76	61
15	0.000	0	0.000	0.000	0.011		0.018	0.000	0.000	76	63
16	0.000	0	0.000	0.000	0.018		0.030	0.000	0.000	77	60
17	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	76	56
18	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	77	57
19	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	76	63
20	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	77	66
21	0.000	0	0.000	0.000	0.001		0.002	0.000	0.000	75	63
22	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	75	66
23	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	77	66
24	0.000	0	0.000	0.000	0.001		0.001	0.000	0.000	77	66
25	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	76	57
26	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	71	52
27	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	71	58
28	0.000	0	0.000	0.000	0.001		0.001	0.000	0.000	74	56
29	0.613	100	0.613	0.154	0.000		0.000	-0.015	1.022	74	62
30	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	74	67
31	0.000	0	0.000	0.000	0.001		0.001	0.000	0.000	75	66
SUM	16.042	-	16.041	6.641	0.034	N.A.	0.057	-1.882	26.736	-	-
AVG	0.517	100	0.517	0.214	0.001	N.A.	0.002	-0.061	0.862	76	63
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE COOLING SUBSYSTEM

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VIRGINIA SOLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MON.	SPACE COOLING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG DRY BULB TEMP F	AMB TEMP DEG F
1	0.000	0	0.000	0.000	0.000	0.000	N	0.000	N	76	55
2	0.000	0	0.000	0.000	0.000	0.000	O	0.000	O	77	57
3	0.000	0	0.000	0.000	0.000	0.000	T	0.000	T	78	63
4	0.000	0	0.000	0.000	0.000	0.000		0.000		77	55
5	0.000	0	0.000	0.000	0.000	0.000	A	0.000	A	74	52
6	0.000	0	0.000	0.000	0.000	0.000	P	0.000	P	76	60
7	1.162	1	0.000	0.377	0.233	0.333	P	0.021	P	78	69
8	4.763	0	0.021	1.354	0.964	1.378	L	0.105	L	78	75
9	6.174	0	1.223	1.708	1.243	1.775	I	-0.016	I	77	76
10	4.844	54	4.639	1.691	0.431	0.616	C	0.811	C	78	77
11	5.603	35	4.654	2.345	0.767	1.096	A	0.649	A	78	74
12	6.976	15	1.818	2.143	1.216	1.737	B	0.403	B	75	72
13	0.000	0	0.000	0.000	0.000	0.000	L	0.000	L	78	65
14	0.000	0	0.000	0.000	0.000	0.000	E	0.000	E	76	61
15	1.223	100	2.489	0.521	0.000	0.000		0.406		76	63
16	0.000	0	0.000	0.000	0.000	0.000		0.000		77	60
17	0.394	100	1.848	0.303	0.000	0.000		0.096		76	56
18	0.357	100	1.563	0.288	0.000	0.000		0.060		77	57
19	0.000	0	0.000	0.000	0.000	0.000		0.000		76	63
20	0.000	0	0.000	0.000	0.000	0.000		0.000		77	66
21	2.767	32	2.043	1.146	0.457	0.653		0.310		75	63
22	2.011	100	3.957	0.956	0.000	0.000		0.660		75	66
23	2.902	44	2.519	1.306	0.335	0.479		0.417		77	66
24	3.661	15	1.886	1.567	0.697	0.995		0.120		77	66
25	0.000	0	0.000	0.000	0.000	0.000		0.000		76	57
26	0.000	0	0.000	0.000	0.000	0.000		0.000		71	52
27	0.000	0	0.000	0.000	0.000	0.000		0.000		71	58
28	0.000	0	0.000	0.000	0.000	0.000		0.000		74	56
29	0.231	100	1.023	0.265	0.000	0.000		0.045		74	62
30	0.000	0	0.000	0.000	0.000	0.000		0.000		74	67
31	0.758	100	1.541	0.440	0.000	0.000		0.248		75	66
SUM	43.826	-	31.224	16.410	6.343	9.062	N.A.	4.336	N.A.	-	-
AVG	1.414	30	1.007	0.529	0.204	0.292	N.A.	0.140	N.A.	76	63
NBS	Q502	N500	Q500	Q503	Q501		Q508	Q512	Q514	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VIRGINIA SOLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	2369	N	55	61	N	N	N
2	2257	O	57	68	O	O	O
3	529	T	63	67	T	T	T
4	398		55	56			
5	2364	A	52	57	A	A	A
6	2135	P	60	71	P	P	P
7	2214	P	69	80	P	P	P
8	2165	L	75	86	L	L	L
9	2126	I	76	*	I	I	I
10	1892	C	77	89	C	C	C
11	2138	A	74	88	A	A	A
12	1177	B	72	78	B	B	B
13	427	L	65	68	L	L	L
14	1238	E	61	*	E	E	E
15	1796		63	77			
16	2666		60	*			
17	2380		56	65			
18	1465		57	67			
19	1727		63	70			
20	1466		66	72			
21	438		63	65			
22	2261		66	73			
23	822		66	70			
24	1524		66	70			
25	698		57	59			
26	862		52	55			
27	1202		58	66			
28	798		56	62			
29	1626		62	72			
30	1898		67	79			
31	704		66	72			
SUM	47764	N.A.	-	-	-	-	-
AVG	1541	N.A.	63	70	N.A.	N.A.	N.A.
NBS ID	0001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
THERMODYNAMIC CONVERSION EQUIPMENT

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VISOLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	0.000	0.000	0.000	N	0.000
2	0.000	0.000	0.000	O	0.000
3	0.000	0.000	0.000	T	0.000
4	0.000	0.000	0.000		0.000
5	0.000	0.000	0.000	A	0.000
6	0.000	0.000	0.000	P	0.000
7	0.011	0.000	0.004	P	0.000
8	0.000	0.021	0.005	L	0.017
9	0.018	1.223	0.117	I	0.021
10	2.626	4.639	0.501	C	0.566
11	1.936	4.654	0.600	A	0.425
12	1.078	1.818	0.252	B	0.593
13	0.000	0.000	0.000	L	0.000
14	0.000	0.000	0.000	E	0.000
15	1.223	2.489	0.279		0.491
16	0.000	0.000	0.000		0.000
17	0.394	1.848	0.181		0.213
18	0.357	1.563	0.259		0.229
19	0.000	0.000	0.000		0.000
20	0.000	0.000	0.000		0.000
21	0.893	2.043	0.220		0.437
22	2.011	3.957	0.453		0.508
23	1.291	2.519	0.358		0.512
24	0.531	1.886	0.333		0.282
25	0.000	0.000	0.000		0.000
26	0.000	0.000	0.000		0.000
27	0.000	0.000	0.000		0.000
28	0.000	0.000	0.000		0.000
29	0.231	1.023	0.158		0.242
30	0.000	0.000	0.000		0.000
31	0.758	1.541	0.176		0.492
SUM	13.359	31.224	3.897	*	0.436
AVG	0.431	1.007	0.126	*	0.014

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.
NOTE:

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
AUXILIARY THERMODYNAMIC CONVERSION EQUIPMENT

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VISOLAR/2036-79/05
REPORT PERIOD: MAY,1979

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	0.000	0.000	0.000	N	0.000
2	0.000	0.000	0.000	O	0.000
3	0.000	0.000	0.000	T	0.000
4	0.000	0.000	0.000		0.000
5	0.000	0.000	0.000	A	0.000
6	0.000	0.000	0.000	P	0.000
7	1.151	0.333	0.397	P	3.458
8	4.763	1.378	1.668	L	3.457
9	6.156	1.775	2.097	I	3.468
10	2.218	0.616	0.771	C	3.602
11	3.667	1.096	1.286	A	3.346
12	5.898	1.737	2.048	B	3.395
13	0.000	0.000	0.000	L	0.000
14	0.000	0.000	0.000	E	0.000
15	0.000	0.000	0.000		0.000
16	0.000	0.000	0.000		0.000
17	0.000	0.000	0.000		0.000
18	0.000	0.000	0.000		0.000
19	0.000	0.000	0.000		0.000
20	0.000	0.000	0.000		0.000
21	1.874	0.653	0.833		2.869
22	0.000	0.000	0.000		0.000
23	1.612	0.479	0.592		3.363
24	3.130	0.995	1.231		3.144
25	0.000	0.000	0.000		0.000
26	0.000	0.000	0.000		0.000
27	0.000	0.000	0.000		0.000
28	0.000	0.000	0.000		0.000
29	0.000	0.000	0.000		0.000
30	0.000	0.000	0.000		0.000
31	0.000	0.000	0.000		0.000
SUM	30.467	9.062	10.923	*	-
AVG	0.983	0.292	0.352	N.A.	3.362

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.
NOTE:

*U.S. GOVERNMENT PRINTING OFFICE: 1979-640-189/4196. Region 4.

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